USER GUIDE

LaserAce™ 1000 rangefinder

Trimble

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LaserAce™ 1000 rangefinder

Version 1.00
Revision B
June 2011

Trimble

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Release Notice

This is the June 2011 release (Revision B) of the *LaserAce 1000 Rangefinder User Guide*. It applies to version 1.00 of the LaserAce 1000 firmware.

Limited Warranty Terms and Conditions

Product Limited Warranty

Subject to the terms and conditions set forth herein, Trimble Navigation Limited ("Trimble") warrants that for a period of (1) year from date of purchase this Trimble product (the "Product") will substantially conform to Trimble's publicly available specifications for the Product and that the hardware and any storage media components of the Product will be substantially free from defects in materials and workmanship.

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If the Trimble Product fails during the warranty period for reasons covered by this limited warranty and you notify Trimble of such failure during the warranty period, Trimble will repair OR replace the nonconforming Product with new, equivalent to new, or reconditioned parts or Product, OR refund the Product purchase price paid by you, at Trimble's option, upon your return of the Product in accordance with Trimble's product return procedures then in effect.

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To obtain warranty service for the Product, please contact your Trimble dealer. Alternatively, you may contact Trimble to request warranty service at +1-408-481-6940 (24 hours a day) or e-mail your request to trimble_support@trimble.com. Please be prepared to provide:

- your name, address, and telephone numbers;
- proof of purchase;
- a copy of this Trimble warranty
- a description of the nonconforming Product including the model number; and
- an explanation of the problem.

The customer service representative may need additional information from you depending on the nature of the problem.

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This Product limited warranty shall only apply in the event and to the extent that (i) the Product is properly and correctly installed, configured, interfaced, maintained, stored, and operated in accordance with Trimble's applicable operator's manual and specifications, and; (ii) the Product is not modified or misused. This Product limited warranty shall not apply to, and Trimble shall not be responsible for, defects or performance problems resulting from (i) the combination or utilization of the Product with hardware or software products, information, data, systems, interfaces, or devices not made, supplied, or specified by Trimble; (ii) the operation of the Product under any specification other than, or in addition to, Trimble's standard specifications for its products; (iii) the unauthorized installation, modification, or use of the Product; (iv) damage caused by: accident, lightning or other electrical discharge, fresh or salt water immersion or spray (outside of Product specifications); or exposure to environmental conditions for which the Product is not intended; (v) normal wear and tear on consumable parts (e.g., batteries); or (vi) cosmetic damage. Trimble does not warrant or guarantee the results obtained through the use of the Product or Software, or that software components will operate error free.

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TRIMBLE'S ENTIRE LIABILITY UNDER ANY PROVISION HEREIN SHALL BE LIMITED TO THE AMOUNT PAID BY YOU FOR THE PRODUCT. TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, IN NO EVENT SHALL TRIMBLE OR ITS SUPPLIERS BE LIABLE FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGE WHATSOEVER UNDER ANY CIRCUMSTANCE OR LEGAL THEORY RELATING IN ANYWAY TO THE PRODUCTS, SOFTWARE AND ACCOMPANYING DOCUMENTATION AND MATERIALS, (INCLUDING, WITHOUT LIMITATION, DAMAGES FOR LOSS OF BUSINESS PROFITS, BUSINESS INTERRUPTION, LOSS OF DATA, OR ANY OTHER PECUNIARY LOSS), REGARDLESS OF WHETHER TRIMBLE HAS BEEN ADVISED OF THE POSSIBILITY OF ANY SUCH LOSS AND REGARDLESS OF THE COURSE OF DEALING WHICH DEVELOPS OR HAS DEVELOPED BETWEEN YOU AND TRIMBLE. BECAUSE SOME STATES AND JURISDICTIONS DO NOT ALLOW THE EXCLUSION OR LIMITATION OF LIABILITY FOR CONSEQUENTIAL OR INCIDENTAL DAMAGES, THE ABOVE LIMITATION MAY NOT APPLY TO YOU.

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Official Language

THE OFFICIAL LANGUAGE OF THESE TERMS AND CONDITIONS IS ENGLISH. IN THE EVENT OF A CONFLICT BETWEEN ENGLISH AND OTHER LANGUAGE VERSIONS, THE ENGLISH LANGUAGE SHALL CONTROL.

Notices

Class B statement- Notice to users This equipment has been tested and found to comply with the limits for a Class B digital device pursuant to Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions may cause harmful interference to radio communication.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Changes and modifications not expressly approved by the manufacturer or registrant of this equipment can void your authority to operate this equipment under Federal Communications Commission rules.

The radio devices used by this equipment are classified under 47 CFR §15.247 as spread spectrum transmitter equipment. In accordance with OET Bulletin 65 supplement C Edition 1-01, the device operates at low

power levels where there is a high likelihood of compliance with the RF exposure standards, is categorically excluded from routine environmental evaluation as set forth in CFR 47 section 2.1093. The radiated output power of this equipment produces a calculated SAR that is significantly below the FCC radio frequency exposure limits.

Canada

This Class B digital apparatus complies with Canadian ICES-003.

This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus as set out in the radio interference regulations of the Canadian Department of Communications.

Cet appareil numérique de la classe B est conforme à la norme NNB-003 du Canada.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de Classe B prescrites dans le règlement sur le brouillage radioélectrique édicté par le Ministère des Communications du Canada.

Europe

This product has been tested and found to comply with all requirements for CE Marking and sale within the European Economic Area (EEA).

It is classified and marked as being Class 2 Radio Equipment under 2000/299/EC, as Bluetooth approvals are country specific. Please consult your local distributor for more information. The Trimble LaserAce 1000 rangefinder has Bluetooth approval in most EU countries and satisfies the requirements for Radio and Telecommunication Terminal Equipment specified by European Council Directive 1999/5/EC. These requirements provide reasonable protection against harmful interference when the equipment is operated appropriately in a residential or commercial environment.

Australia and New Zealand

This product conforms with the regulatory requirements of the Australian Communications and Media Authority (ACMA) EMC framework, thus satisfying the requirements for C-Tick Marking and sale within Australia and New Zealand.

Notice to Our European Union Customers

For product recycling instructions and more information, please go to www.trimble.com/ev.shtml.

Recycling in Europe: To recycle Trimble WEEE (Waste Electrical and Electronic Equipment, products that run on electrical power.), Call +31 497 53 24 30, and ask for the "WEEE Associate". Or, mail a request for recycling instructions to:
Trimble Europe BV
c/o Menlo Worldwide Logistics
Meerheide 45
5521 DZ Eersel, NL

Contents

Safety Information

Before you use the Trimble® LaserAce™ 1000 rangefinder, make sure that you have read and understood all safety requirements.

How to interpret the safety information

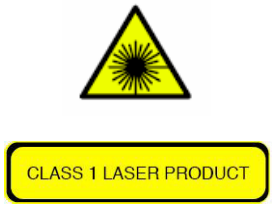
WARNING – This alert warns of a potential hazard which, if not avoided, could result in severe injury or even death.

CAUTION – This alert warns of a potential hazard or unsafe practice that could result in minor injury or property damage or irretrievable data loss.

***Note** – An absence of specific alerts does not mean that there are no safety risks involved.*

Using the LaserAce 1000 rangefinder safely

The United States Government Center of Devices for Radiological Health (CDRH) has certified the laser in the LaserAce 1000 rangefinder as a Class 1 laser product.



This means there is no risk of injury when you use the rangefinder in accordance with the instructions in this manual. Class 1 lasers are the safest available, with laser energy similar to that inside a compact disc player.

WARNING – The LaserAce 1000 rangefinder has a Class 1 eye safe (FDA/IEC) rating. However, you should take care when using the rangefinder to minimize the risk of damage to your eyesight or that of other people's. Specifically:

– Do not direct the rangefinder toward the sun or another high power, infrared light source.
– Do not unnecessarily look into the transmitter lens of the rangefinder.
– Do not point the rangefinder directly at other people's eyes, especially if they are using binoculars.

AC adapter safety

WARNING – To use AC adapters safely:
– Use only the AC adapter intended for the LaserAce 1000 rangefinder. Using any other AC adapter can damage the unit and may void your warranty. Do not use the AC adapter with any other product.
– Make certain that the input voltage on the adapter matches the voltage and frequency in your location. In Europe, use a 220 V adapter; in the Americas use a 120 V adapter.
– Make certain that the adapter has prongs compatible with your outlets.
– Do not use the AC adapter in wet outdoor areas; it is designed for indoor use only.
– Unplug the AC adapter from power when not in use.
– Do not short the output connector.
– Be aware that there are no user-serviceable parts in this product.
– If the AC adapter becomes damaged, replace it with a new Trimble AC adapter.

Battery safety

WARNING – Do not damage the rechargeable Lithium-ion battery. A damaged battery can cause an explosion or fire, and can result in personal injury and/or property damage.
To prevent injury or damage:
– Do not use or charge the battery if it appears to be damaged. Signs of damage include, but are not limited to, discoloration, warping, and leaking battery fluid.
– Do not expose the battery to fire or high temperature.
– Do not immerse the battery in water.
– Do not use or store the battery inside a vehicle during hot weather.
– Do not drop or puncture the battery.
– Do not open the battery or short-circuit its contacts.

WARNING – Avoid contact with the rechargeable Lithium-ion battery if it appears to be leaking. Battery fluid is corrosive, and contact with it can result in personal injury and/or property damage.
To prevent injury or damage:
– If the battery leaks, avoid contact with the battery fluid.
– If battery fluid gets into your eyes, immediately rinse your eyes with clean water and seek medical attention. Do not rub your eyes!
– If battery fluid gets onto your skin or clothing, immediately use clean water to wash off the battery fluid.

WARNING – Charge and use the rechargeable Lithium-ion battery only in strict accordance with the instructions. Charging or using the battery in unauthorized equipment can cause an explosion or fire, and can result in personal injury and/or equipment damage.
To prevent injury or damage:
– Do not charge or use the battery if it appears to be damaged or leaking.
– Charge the Lithium-ion battery only in a Trimble product that is specified to charge it. Be sure to follow all instructions that are provided with the battery charger.
– Discontinue charging a battery that gives off extreme heat or a burning odor.
– Use the battery only in Trimble equipment that is specified to use it.
– Use the battery only for its intended use and according to the instructions in the product documentation.

CHAPTER

1

Introduction

In this chapter:

Welcome to the *LaserAce 1000 Rangefinder User Guide*. This guide describes how to set up and use the Trimble® LaserAce™ 1000 rangefinder.

Even if you have used other rangefinder products before, Trimble recommends that you spend some time reading this guide to learn about the special features of the product.

About the LaserAce 1000 rangefinder

The LaserAce 1000 rangefinder is a three-dimensional (3D) laser rangefinder that enables you to measure points using a simple "point and shoot" workflow. Measurements and calculations are displayed on the back-lit LCD panel.

The rangefinder incorporates a pulsed laser distance meter and compass. Use the sighting scope to aim and measure range, vertical, and horizontal angles to passive targets up to 150 m (500 feet) away. Using a reflective foil target, you can measure targets up to 600 m (2000 feet) away.

You can connect the rangefinder to a Trimble Mapping & GIS handheld using Bluetooth wireless technology and then automatically output the rangefinder data to the GPS field software running on the handheld. This is especially useful when you are using the rangefinder to map assets using offset positions, for example for assets that are located in difficult GNSS environments or in difficult-to-access areas, such as on a traffic island in a busy highway.

The rangefinder is Class 1 eye safe (FDA/IEC). Lightweight and compact, it is designed for all-day field work.

The LaserAce 1000 rangefinder comes in three varieties, depending on the firmware version that is installed. These are described below.

LaserAce 1000 rangefinder with GIS firmware

The LaserAce 1000 rangefinder with GIS firmware incorporates a pulsed laser distance meter, inclinometer, and compass. Use this version of the rangefinder to perform the following calculations:

- Distance rangefinder measurement
- Subtended distance (diameter measurement)
- Area and volume calculation
- Three-point heighting
- Cable detection using rapid fire mode

Note – *When running the GIS firmware, the LaserAce 1000 rangefinder does not provide a "Save" function for saving data.*

LaserAce 1000 rangefinder with hypsometer firmware

The LaserAce 1000 rangefinder with hypsometer firmware is designed to help foresters easily and efficiently measure the height of a tree, its diameter (at any height), simple or "taper" log volumes, and tree lean. Use this version of the rangefinder to perform the following calculations:

- Measuring reflectorless ranges up to 150 m / 500 ft
- Brush filter mode (for use with reflective tape)

- Critical range gating for area plots
- Critical height and diameter detection
- Heighting (with built-in inclinometer)
- Two-point height and lean measurement
- Three-point height measurement
- Diameter measurement
- Log volumes
- Plot sampling

The hypsometer firmware automatically carries out mathematical calculations for instant field results. The rangefinder stores up to 2000 results for later viewing and downloading to a computer using a Bluetooth wireless connection.

LaserAce 1000 rangefinder with burden finder firmware

The LaserAce 1000 rangefinder with burden finder firmware is designed to accurately determine rock face or blast hole burdens in three easy steps. It also provides an internal digital compass for measuring face width.

Use this version of the rangefinder to:

- Set up drill parameters such as drill angle, collar to crest offset, and minimum burden.
- Set up bench details such as the crest and toe of the profile.
- Shoot the profile of the rock face and obtain instant burden and depth measurements based on the drill parameters and bench details you have entered.
- Measure the width of the rock face.

The rangefinder stores burden and depath table measurements for later viewing, editing, and recalculating. The stored data can later be downloaded to a computer using a Bluetooth wireless connection.

What's in the box?

When you unpack the LaserAce 1000 rangefinder, check that you have received all the components, as shown below.

Figure 1.1 Components provided with the LaserAce 1000 rangefinder

Inspect all contents for visible damage (scratches, dents) and if any components appear damaged, notify the shipping carrier. Keep the shipping and packaging material for the carrier's inspection.

General guidelines for using the rangefinder

WARNING – The LaserAce 1000 rangefinder has a Class 1 eye safe (FDA/IEC) rating. However, you should take care when using the rangefinder to minimize the risk of damage to your eyesight or that of other people's. Specifically:
– Do not direct the rangefinder toward the sun or another high power, infrared light source.
– Do not unnecessarily look into the transmitter lens of the rangefinder.
– Do not point the rangefinder directly at other people's eyes, especially if they are using binoculars.

Hold the rangefinder in the right hand, like a camcorder, by putting your fingers through the handstrap and aiming the lenses at the target. Trimble recommends using the right eye to look through the eyepiece while keeping the left eye open to make identifying the correct target easier.

Identify the target by sighting the target through the telescopic sighting scope. If a valid range or measurement is observed, a beep sounds.

Obtaining optimal range

The maximum range observable can vary due to:

- size of the target (with respect to the laser beam footprint, see below)
- environmental conditions

  For example, longer ranges are possible in overcast/dark conditions, but bright sunlight results in shorter ranges. Rain or snow will result in shorter ranges.

To obtain optimal ranges:

- Use good reflective targets such as light-colored rocks, light-colored masonry and stone, and reflective traffic signs, vehicle reflectors, and foils.
- Try to observe targets that are in the shade or away from prevailing sunlight.
- Use targets that are the same size or larger than the laser beam footprint:

Distance to Target	Typical Dimension of the Measuring Beam (footprint)
100 m (328 ft)	25 cm (10 in)
200 m (656 ft)	50 cm (19.6 in)
300 m (984 ft)	75 cm (29.5 in)
400 m (1312 ft)	100 cm (39 in)

Note – *The rangefinder is not designed for use with reflectors at ranges below 100 m (328 in). Only use reflectors for ranges above 150 m (492 ft).*

Caring for the rangefinder

When using the rangefinder:

- Keep the outer surface free of dirt and dust.
- Protect the rangefinder from extreme temperatures. For example, do not leave the rangefinder on the dashboard of a vehicle.

To clean the rangefinder, wipe it with a clean dry cloth. Do ***not*** immerse the rangefinder in water or use paint solvents to clean the unit.

To clean the metal contacts of the battery and the charger unit, wipe them with a clean dry cloth.

Storage

If you are not going to use the rangefinder for several weeks or more, Trimble recommends that you remove the battery from the base of the unit and fully charge it before being put away.

Store the rangefinder at normal room temperature.

Technical assistance

Technical support

Go to www.trimble.com/mappingGIS/laser.aspx and then click *Support* for the latest support information about the product, including:

- support notes detailing support issues
- documentation
- the latest files available for download

Additional help

If you still cannot find the information that you need, ***contact your Trimble reseller***.

Your comments

Your feedback about the supporting documentation helps Trimble to improve it with each revision. Email your comments to ReaderFeedback@trimble.com.

CHAPTER

2

Getting Started

In this chapter:

This chapter describes how to get up and running with the LaserAce 1000 rangefinder.

Parts of the LaserAce 1000 rangefinder

The following diagram shows the main parts of the rangefinder.

Figure 2.1 Parts of the LaserAce 1000 rangefinder

Button functions

The buttons on the rangefinder have the following functions:

Button	Function
Fire 	Turns on the rangefinder. Selects a menu item. Takes a reading.
	Takes the user back up a level/cancels the selection.
	Scrolls through a menu. Toggles between raw data and calculated data.
	Accesses accumulated data.

Charging the battery

The rangefinder is powered by a removeable, rechargeable 7.2V Lithium-ion battery.

Charge the battery using the AC adapter battery charger provided with the rangefinder.

AC adapter safety

WARNING – To use AC adapters safely:
– Use only the AC adapter intended for the LaserAce 1000 rangefinder. Using any other AC adapter can damage the rangefinder and may void your warranty. Do not use the AC adapter with any other product.
– Make certain that the input voltage on the adapter matches the voltage and frequency in your location. In Europe, use a 220 V adapter; in the Americas use a 120 V adapter.
– Make certain that the adapter has prongs compatible with your outlets.
– Do not use the AC adapter in wet outdoor areas; it is designed for indoor use only.
– Unplug the AC adapter from power when not in use.
– Do not short the output connector.
– Be aware that there are no user-serviceable parts in this product.
– If the AC adapter becomes damaged, replace it with a new Trimble AC adapter.

Battery safety

WARNING – Do not damage the rechargeable Lithium-ion battery. A damaged battery can cause an explosion or fire, and can result in personal injury and/or property damage. To prevent injury or damage:
– Do not use or charge the battery if it appears to be damaged. Signs of damage include, but are not limited to, discoloration, warping, and leaking battery fluid.
– Do not expose the battery to fire or high temperature.
– Do not immerse the battery in water.
– Do not use or store the battery inside a vehicle during hot weather.
– Do not drop or puncture the battery.
– Do not open the battery or short-circuit its contacts.

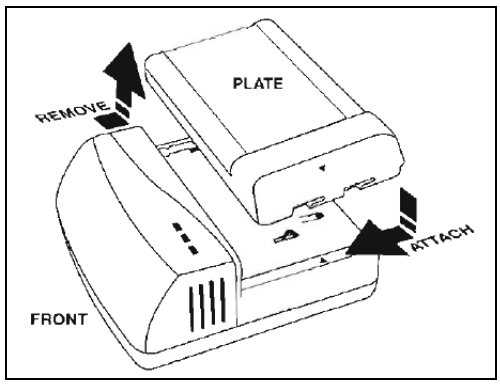
WARNING – Avoid contact with the rechargeable Lithium-ion battery if it appears to be leaking. Battery fluid is corrosive, and contact with it can result in personal injury and/or property damage.
To prevent injury or damage:
– If the battery leaks, avoid contact with the battery fluid.
– If battery fluid gets into your eyes, immediately rinse your eyes with clean water and seek medical attention. Do not rub your eyes!
– If battery fluid gets onto your skin or clothing, immediately use clean water to wash off the battery fluid.

WARNING – Charge and use the rechargeable Lithium-ion battery only in strict accordance with the instructions. Charging or using the battery in unauthorized equipment can cause an explosion or fire, and can result in personal injury and/or equipment damage.
To prevent injury or damage:
– Do not charge or use the battery if it appears to be damaged or leaking.
– Do not leave the battery in the charger unit for prolonged periods. Remove the battery after charge is complete.
– Charge the Lithium-ion battery only in the charger unit provided with the battery.
– Discontinue charging a battery that gives off extreme heat or a burning odor.
– Use the battery only in Trimble equipment that is specified to use it.
– Use the battery only for its intended use and according to the instructions in the product documentation.

Charging the battery

Note – *Charge the battery completely before using the rangefinder for the first time. If the battery has been stored for longer than several weeks, charge it before use. Trimble recommends charging the battery for two hours to recharge it fully.*

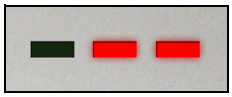
To charge the battery:



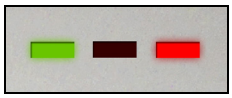
1. Insert the adapter plate for the battery into the battery charger. To do this, align the arrows on the side of the adapter plate with the base of the charger, as shown. While pressing down lightly on the adapter plate, slide the plate toward the front of the charger base until it locks.
2. Plug the AC adapter into the power input jack at the rear of the charger unit and then connect the AC adapter to mains power.

   The red Power Indicator LED on the far right of the unit turns on to indicate the charging unit is receiving power.
3. Insert the battery into the charger unit.

   The red Charging LED in the center of unit turns on to indicate the battery is charging:



   When the battery is around 90% charged, the red Charging LED turns off and the green Charge Complete LED on the left turns on:



   This indicates that the charger has switched from rapid charge mode to trickle charge mode.

   After two hours, the battery reaches 100% charge.

Note – *Make sure you remove the battery from the charger unit within a few hours of the green LED turning on.*

Inserting the battery into the rangefinder

When fully charged, clip the battery onto the base of the unit. To fit the battery, align the contacts on the unit with the contacts on the battery, and slide the battery into the battery slot.

When fully charged, the battery provides enough power for a full working day.

Note – *Cold temperatures, or using Bluetooth wireless technology consumes additional battery power and so shortens battery life between charges.*

The battery icon  on the rangefinder indicates the remaining power available from the battery.

Low battery indicator

When the battery reaches the low power level, the battery icon  flashes and a beep sounds. The message LOW BATTERY POWER SWITCHING OFF appears on the display and then the unit turns itself off.

Turning on and turning off the rangefinder

Turning on the rangefinder

To turn on the rangefinder, press and hold the Fire button until the unit turns on.

The LCD display briefly shows the date of the rangefinder firmware, status messages, and then shows the main menu screen.

From the main menu screen you can access each of the measurement functions or you can access the setup menu.

Press ▲ to scroll through menu items and then press the **Fire** button to make your selection.

Turning off the rangefinder

To turn off the rangefinder, press and hold the ● and ■ buttons at the same time until the display shows SWITCHING OFF and the digital timer counts down from 5 to 0.

To cancel, release the keys before 0 is reached. The display returns to the previous screen.

If auto switch-off is activated, the unit automatically turns off one minute after the last key press. For more information, see the “Selecting the operating mode” section of the relevant operation chapter for your firmware.

Setting the magnetic declination

Note – *When the rangefinder is shipped from the factory, the magnetic declination is set to zero. Before you begin using the rangefinder, you may need to enter a magnetic declination for your geographic area. If you are using the Trimble TerraSync™ software with default Units settings you do not need to set the magnetic declination, and should leave it as zero. You can check these settings in the Units form, in the Setup screen. If the North Reference is set to True and the Magnetic Declination is set to Auto then the TerraSync software will find the declination and apply it to the offset measurements automatically.*

The earth is completely surrounded by a magnetic field, and any unobstructed magnetized object, or North-seeking compass, will orient itself with the magnetic North and South poles if free to rotate. Magnetic declination (also known as magnetic variation) is the difference in the bearing, or angle, from your position to true North (also known as the North Pole) and magnetic North, which is located somewhere in Northern Canada.

Magnetic declination varies significantly from location to location around the world and also varies slightly from year to year. It is important to find out the correct magnetic declination for your area so that the calculations the unit performs are correct.

Magnetic declination is stated as a number. To find out the magnetic declination for your location, do one of the following:

- scale it from a chart
- calculate it from accurately known geographic coordinate points
- calculate it using the National Oceanic and Atmospheric Administration (NOAA) website. Go to www.ngdc.noaa.gov/geomagmodels/Declination.jsp and then enter your zip code or the latitude and longitude values for your location.

To enter the magnetic declination:

1. From the main menu screen, select *Setup*.
2. Select *Configuration*.
3. Select *Compass*.
4. Select *Declination Angle*.
5. Enter the angle and then select whether the angle is east or west.

Connecting to a Trimble MGIS handheld

Connect the rangefinder to a Trimble Mapping & GIS handheld to automatically add measurements and calculations as attributes in the GPS field software running on the handheld.

To set up the connection, you must:

1. Connect the handheld to the rangefinder.
2. Configure the COM port on the handheld to use for the connection.
3. Configure the GPS field software running on the handheld to use data received from the rangefinder.

Once you have set up the connection, you can connect the devices at any time. To do this, make sure that the handheld and the rangefinder are within five meters of each other, and that the Bluetooth radio in the handheld is turned on.

Step 1: Connecting the handheld to the rangefinder

Set up a paired connection using Bluetooth wireless technology. To do this:

1. Make sure that the handheld and the rangefinder are within five meters of each other, and that the Bluetooth radio in the handheld is turned on.
2. On the handheld, open the Bluetooth manager (to do this, you usually tap *Start* / *Settings* / *Connections* / *Bluetooth)*.
3. In the *Devices* tab, tap *Add new device*. The handheld searches for other Bluetooth devices and displays them in the list.

   If the rangefinder is not displayed in the list, ensure that the unit is on and within range and then tap **Refresh** to search for devices again.
4. Select the rangefinder in the list and then tap **Next** on the right softkey.
5. In the *Passcode* field, enter the passcode for the rangefinder. This is "1234".
6. Tap **Next** on the right softkey.

   On the handheld, the *Partnership Settings* screen appears.
7. If required, change the name of the device in the *Display Name* field.
8. Select the *Serial Port* service check box.
9. Tap **Finish** on the right softkey.
10. Tap **OK** in the top right corner of the screen to close the Bluetooth application.

Step 2: Configuring the COM port to use on the handheld

1. On the handheld, open the Bluetooth manager.
2. Tap the *COM Ports* tab.

3. Tap *New Outgoing Port*.
4. Select the rangefinder connection you have set up and then tap **Next** on the right softkey.
5. Select the COM port on the handheld to use for the connection.
6. Do one of the following:
   - To communicate with any device, for example if you have formed this connection without pairing to a device, clear the *Secure Connection* check box.
   - To communicate only with devices with which the handheld has a Bluetooth partnership, select the *Secure Connection* check box.
7. Tap **Finish** on the right softkey.
8. Close the Bluetooth manager.

Step 3: Configuring the GPS field software to use data from the rangefinder

The steps below describe how to configure the Trimble TerraSync software to use data from the rangefinder:

1. Start the TerraSync software and then open a data file.
2. In the *Setup* section, tap **External Sensors**. The *External Sensors* form appears.
3. Select the *Laser* check box and then tap the **Properties** button beside the *Laser* check box. The *Laser Properties* form appears.
4. From the *Port* drop-down list, select the name of the COM port that you selected in the Bluetooth application when you set up the connection to the device.
5. Tap **OK** to confirm the sensor settings and return to the *External Sensors* form.
6. Tap **OK** to confirm the settings and return to the main screen of the Setup section.
7. The rangefinder is now setup for use and can be used to add data as attributes into an open file in TerraSync. The device is automatically connected and disconnected when data files in TerraSync are opened and closed.

   To check the status of the connection, select the Comms subsection in the Status section of the GPS field software .

Calibrating the compass

Note – *The rangefinder's internal compass is sensitive to many factors, including changing the battery and changes in the environment. Trimble recommends calibrating the internal compass* ***at the start of each data collection session****.*

To calibrate the compass:

1. From the main menu screen, select *Setup*.
2. Select *Configuration*.
3. Select *Compass*.
4. Select *User Calibration*.
5. When prompted, press any key to start the calibration process.
6. Perform the calibration process described below:

Note – *The slower and steadier the rotation the better chance of getting an accurate calibration. For each of the three rotation procedures listed below, each involves two rotations which should take approximately one minute total to complete (two rotations x 30 seconds each). Any bumps in motion could cause errors in the pitch and roll as they are seen as acceleration on the sensors.*

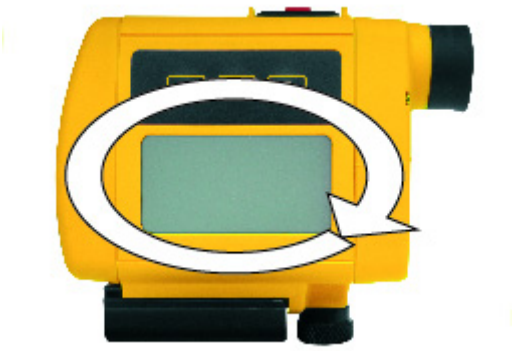
a. Point the unit (lenses) toward North with the LCD facing upward:

b. To start the X and Y gain calibration (on screen described as "On Side"), press any button.

c. Slowly and smoothly rotate the unit through 360 degrees with the lenses moving upward and the eyepiece moving downward. Do this at least twice. Each rotation should take approximately 30 seconds.

d. To end the X and Y gain calibration process, press any button.

e. Point the unit toward North with the **Fire** button facing upward:



f. To start the Z calibration (on screen described as "Vertically"), press any button.

g. Slowly and smoothly rotate the unit through 360 degrees with the lenses moving upward and the eyepiece moving downward. Do this at least twice.

h. To end the Z calibration process, press any button.

i. Point the unit toward North with the **Fire** button facing upward:

j. To start the X and Y calibration (on screen described as "Horizontally"), press any button.

k. Slowly and smoothly rotate the unit through 360 degrees clockwise with the lenses moving to the right and the eyepiece moving to the left. Do this at least twice.

l. To end the X and Y calibration process, press any button.

CHAPTER

3

GIS Measurements

In this chapter:

This chapter describes how to set preferences and take measurements using the rangefinder with the GIS firmware installed.

All of the measurement types described in this chapter can also be used to record offset GPS positions, for example when you cannot access the asset that you want to record the GPS position for, or when the asset is located in a poor GPS environment.

Note – *The LaserAce 1000 rangefinder's internal compass is sensitive to many factors, including changing the battery and changes in the environment. Trimble recommends calibrating the internal compass* ***at the start of each data collection session****. For more information, see* *Calibrating the compass, page 26**.*

Setting rangefinder preferences

To set your preferences for the rangefinder, press  to scroll through the options on the main screen until *Setup* is highlighted and then press the **Fire** button. The *Setup* screen appears.

Selecting units

To select the units used for measurements and calculations for any version of the rangefinder:

1. From the *Setup* screen, select *Units*.
2. Select the measurement and the units you want to use:

Measurement	Available units
Range	Meters, feet
Angles	Degrees, gons

Selecting the operating mode

To change the operating mode:

1. From the *Setup* screen, select *Configuration*.
2. Select the operation and the option you want to use:

Operation	Options
Gradient	Ratio, Angle, Percentage
Ranging	• First Hit The standard mode, used for most types of operation where you have a clear sight of the target. • Last Hit Instructs the laser to return the last detectable hit in a multiple hit scenario. This is useful when ranging through a limited type of single obstructions, such as wire fencing or glass. ***Note –*** *The distance between the initial obstruction and the ultimate target must be several meters for a valid range to be calculated.* ***Note –*** *Last Hit mode cannot be used with reflective targets or prisms, or used to calculate ranges to objects that have numerous obstructions in their path such as scrub, trees, and double-glazing.*
Interface	Trimble Free format ***Note –*** *This is the default setting. Do not change this setting.*

Operation	Options
Power	AutoPower On, Off When Auto Power is set to On, the unit automatically turns off one minute after the last key press.
Compass	• Declination Angle When the LaserAce 1000 rangefinder is shipped from the factory, the magnetic declination is set to zero. Before you begin using the rangefinder, you may need to enter a magnetic declination for your geographic area (see Calibrating the compass, page 26). • Enable/Disable ***Note –*** *The compass is enabled by default. Do not change this setting.* • User Calibration This must be performed at the beginning of every data collection session.

Selecting offset options

To change the options for offsets:

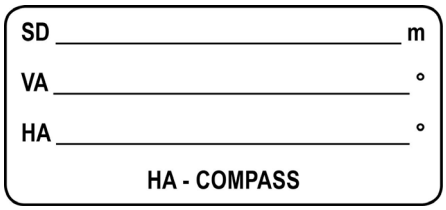
1. From the *Setup* screen, select *Offsets*.
2. Select the value you want to enter and then enter the value.

Offset Value	Description
Instrument Height	Enter the height of the unit (at eye level) from the ground. The entered instrument height is added to the vertical distance (VD) calculated and the total is displayed. A plus sign (+) next to VD indicates the reading is using an instrument height.
Include Back Offset	the distance between the back of the eyepiece and the receiver board. This offset is added while taking ranges.

Rangefinder measurements

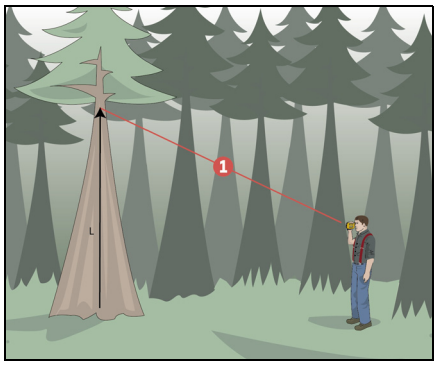
Use the rangefinder function to measure the height of an object.

1. From the main menu screen, select *Rangefinder*. The screen shows:



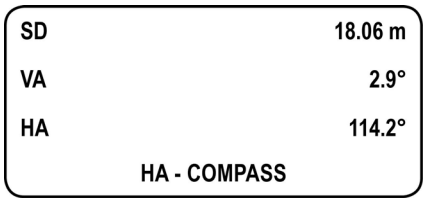
2. Align the crosshairs in the scope with the target and press the **Fire** button. The unit beeps and the results appear on the screen.

Note – *If the unit does not beep, or gives a short, sharp beep and the screen does not show any values, this indicates the rangefinder has been unable to obtain a distance to the target. Try again.*



The screen shows:

- The actual slope distance (SD) from the laser to the target
- The inclination (VA). A minus (-) sign indicates an angle below the horizontal.
- The horizontal angle from North.



To view the horizontal distance (HD) and vertical distance (VD), press ▲. A plus sign (+) after the VD value indicates a height offset has been added. Press ▲ again to return to the SD/VA display.

To take a new measurement, sight the target and then press the **Fire** button.

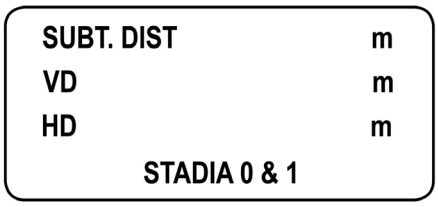
To view an accumulation of data (SD and HD) then in either measurement screen press . This displays a sum of all SD and HD values acquired. To return to the previous screen, press again.

Tip – This method in particular is very useful when you cannot access an asset that you want to record the GNSS position for, or the asset is in a poor GNSS environment. Stand in a good GNSS environment, and use the rangefinder to record an offset GNSS position. For more information, refer to the documentation for your GNSS field software.

Subtended distance measurements

Use the subtended distance function to measure the approximate width of an object (for example, a bridge span or tree width) using one observation.

1. From the main menu screen, select *Subtended Distance*. The screen shows:



2. Look through the eyepiece at the two points you want to measure the distance between. Walk back or forward as required until the object you want to measure is aligned between any two of the stadia hairs in the scope.

To change the stadia hairs you are using in the scope, press key. Press key until the pair of stadia hairs you want to use is shown on the LCD display.

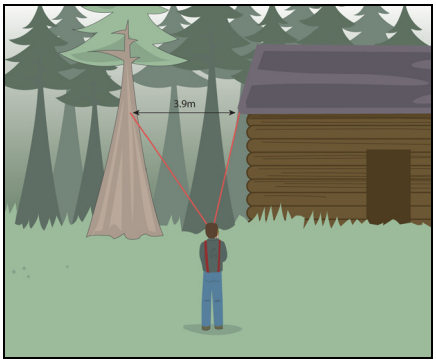
3. To take the reading, press the **Fire** button. The screen shows the subtended distance vertical distance (VD) and horizontal distance (HD).

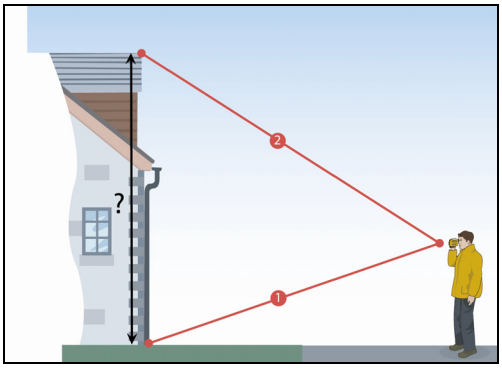
   If you wish to change the stadia hairs at this point, press . The information in the display is updated with recalculated data based on the stadia hairs you select.

   To take a new measurement, press the **Fire** button.

Missing distance measurements using the digital compass

Use the missing distance function to remotely calculate the height and distance between two or more successive points. You can use this function to calculate the height of objects or to calculate the gradient between the measured points.





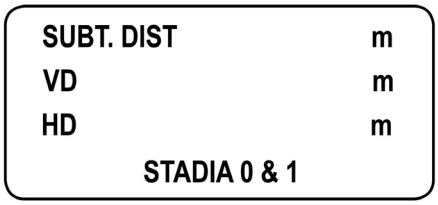
1. From the main menu screen, select *Missing Distance*. The screen shows:

2. Press ▲ to select the stadia hairs that you want to measure the subtended distance between.

Note – *Select nil for the stadia hairs if you want to only calculate the distance between two points.*

3. Align the crosshairs in the scope with the first point you want to shoot and press the **Fire** button. The unit beeps and the results appear on the screen.
4. Align the crosshairs in the scope with the second point you want to shoot and press the **Fire** button.

   The unit beeps and the missing distance between the two points and the subtended distance between the selected stadia hairs appear on the screen.



   To view the gradient, horizontal distance (HD), and the height difference between the two points, press ▲. If a subtended distance was not calculated, only the horizontal distance (HD) and the vertical distance (VD) between the two points is shown.

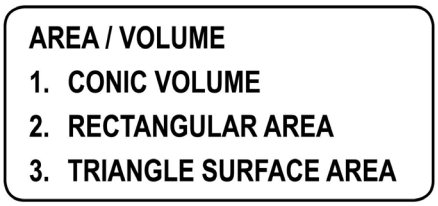
To take a new measurement, press the **Fire** button. The Shoot 1 screen appears (see step 1 above).

To show an accumulation of all of the measured distances, press  . To return to the previous screen, press  again.

Area/volume measurements

Use the area/volume function to remotely calculate the volume of a cone, rectangular area, or a triangle surface area.

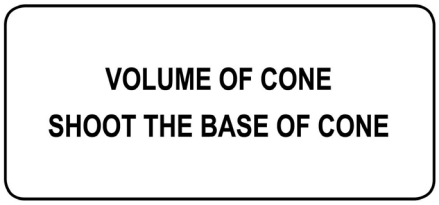
1. From the main menu screen, select *Area/Vol*. The screen shows:



2. Select the type of measurement that you want to calculate.

Calculating a conic volume

1. In the *Area/Vol* screen, select *Conic Volume*. The screen shows:



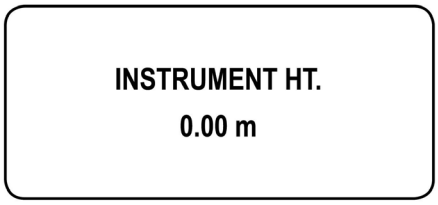
2. Align the crosshairs in the scope with the base of the cone and press the **Fire** button. The unit beeps.
3. Align the crosshairs in the scope with the top of the cone and press the **Fire** button. The unit beeps and the screen shows the calculated volume.

   To view the height of the cone and the radius at the base of the cone, press  .

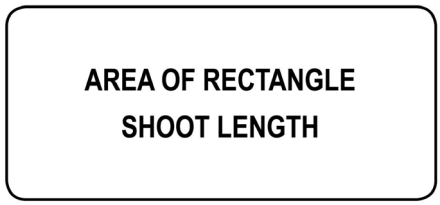
   To view the accumulated area values, press  .

Calculating a rectangular area

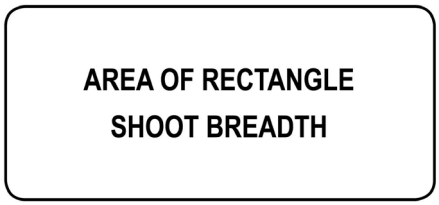
1. In the *Area/Vol* screen, select *Rectangular Area*. The screen shows:



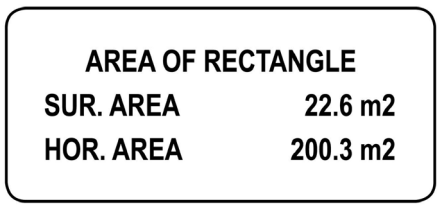
2. If the instrument height value shown is not correct, then enter it now. Press ■ to change a digit and press ▲ to move the cursor to the next digit.
3. To confirm the value entered, press the **Fire** button. The screen shows:



4. Stand at one corner of the rectangular area. Align the crosshairs in the scope with the furthest away adjacent corner of the rectangular area and press the **Fire** button. The unit beeps and the screen shows:



5. Align the crosshairs in the scope with the closest adjacent corner of the rectangular area and press the **Fire** button. The unit beeps and the screen shows the calculated area.

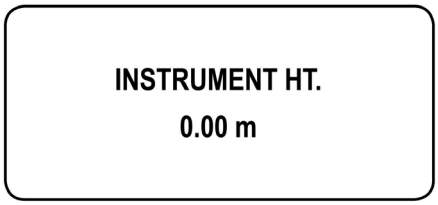


To view the length of the two sides of the rectangular area, press ▲.

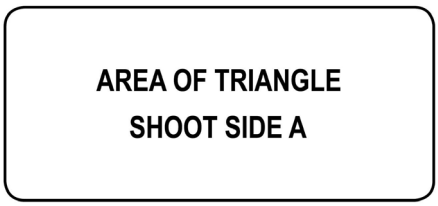
To view the accumulated area values, press ■.

Calculating a triangle surface area

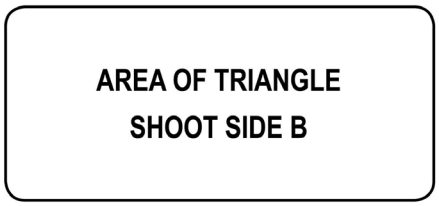
1. In the *Area/Vol* screen, select *Triangle Surface Area*. The screen shows:



2. If the instrument height value shown is not correct, enter it now. Press ■ to change a digit and press ▲ to move the cursor to the next digit.
3. To confirm the value entered, press the **Fire** button. The screen shows:

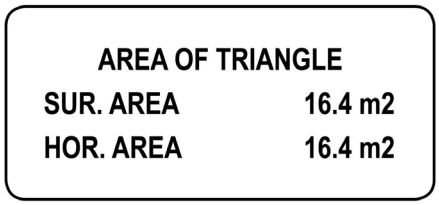


4. Stand at one corner of the triangle. Align the crosshairs in the scope with the first vertex of the triangle and press the **Fire** button. The unit beeps and you are prompted to shoot the second point.



5. Align the crosshairs in the scope with the second vertex of the triangle and press the **Fire** button. The unit beeps and you are prompted to shoot the third point.

6. Move to one of the other points of the triangle and then align the crosshairs in the scope with the third vertex of the triangle and press the **Fire** button. The unit beeps and the screen shows the calculated area.



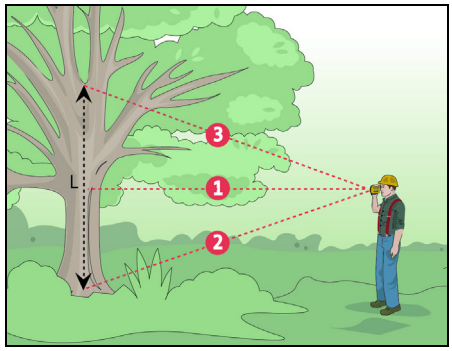
To view the length of the individual sides of the triangle, press  .

To view the accumulated area values, press  .

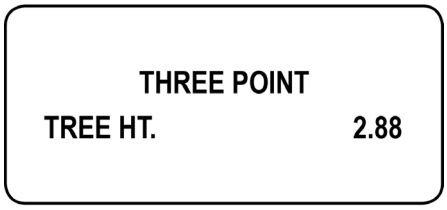
Three-point height measurements

Use the three-point height measurement function to measure height in situations where it is difficult to directly view the two points between which you would usually measure the height.

1. From the main menu screen, select *Three Point Height*. You are prompted to shoot the middle point of the object you are measuring.
2. Align the crosshairs in the scope with the middle point of the object and press the **Fire** button. The unit beeps and you are prompted to shoot the bottom point.
3. Align the crosshairs in the scope with the bottom point of the object (or where it would be, if it is obscured from your view) and press the **Fire** button. The unit beeps and you are prompted to shoot the top point.



4. Align the crosshairs in the scope with the top point of the object (or where it would be, if it is obscured from your view) and press the **Fire** button. The unit beeps and the screen shows the calculated height of the object:



Note – *The bottom and top measurements do not have to obtain a range. The horizontal distance is calculated using the range data taken from the middle point. The angle is taken from the bottom and top points.*

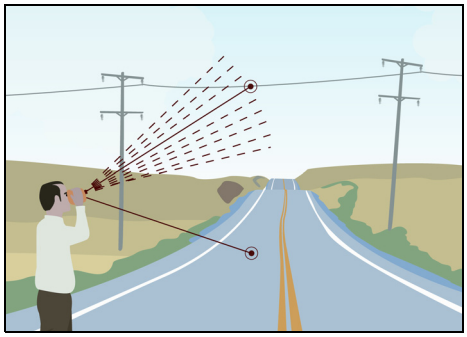
To view the accumulated area values, press  .

Rapid fire measurements

Use the rapid fire function to measure ranges and distances of objects that are difficult to aim at, such as overhanging cables.

1. From the main menu screen, select *Rapid Fire*. The screen shows:

2. Point the unit at the background to the object. For example, point the unit at the sky if it is an overhead cable, or at the ground if it is a cable on the ground. Press the **Fire** button.



3. Press and hold the **Fire** button as you sweep the unit towards and across the object, for example the cable.

   When the unit senses the object, the unit beeps and the screen displays the slope distance (SD), vertical angle (VA), and horizontal angle (HA) data for the object.

   To view the horizontal distance (HD), vertical distance (VD) and measured distance (MD) data for the object, press ▲.

CHAPTER

4

Hypsometer Measurements

In this chapter:

This chapter describes how to set preferences and take measurements using the rangefinder with the hypsometer firmware installed.

All of the measurement types described in this chapter can also be used to record offset GPS positions, for example when you cannot access the asset that you want to record the GPS position for, or when the asset is located in a poor GPS environment.

Note – *The LaserAce 1000 rangefinder's internal compass is sensitive to many factors, including changing the battery and changes in the environment. Trimble recommends calibrating the internal compass* ***at the start of each data collection session****. For more information, see* *Calibrating the compass, page 26**.*

Setting rangefinder preferences

To set your preferences for the rangefinder, press  to scroll through the options on the main screen until *Setup* is highlighted and then press the **Fire** button. The *Setup* screen appears.

Selecting units

To select the units used for measurements and calculations for any version of the rangefinder:

1. From the *Setup* screen, select *Units*.
2. Select the measurement and the units you want to use:

Measurement	Available units
Range	Meters, feet
Angles	Degrees, gons

Selecting the operating mode

To change the operating mode:

1. From the *Setup* screen, select *Configuration*.
2. Select the operation and the option you want to use:

Operation	Options
Gradient	Ratio, Angle, Percentage
Ranging	• First Hit The standard mode, used for most types of operation where you have a clear sight of the target. • Last Hit Instructs the laser to return the last detectable hit in a multiple hit scenario. This is useful when ranging through a limited type of single obstructions, such as wire fencing or glass. ***Note –*** *The distance between the initial obstruction and the ultimate target must be several meters for a valid range to be calculated.* ***Note –*** *Last Hit mode cannot be used with reflective targets or prisms or used to calculate ranges to objects that have numerous obstructions in their path such as scrub, trees, and double-glazing.*
Interface	Trimble Free format ***Note –*** *This is the default setting. Do not change this setting.*
Power	AutoPower On, Off When Auto Power is set to On, the unit automatically turns off one minute after the last key press.

Selecting offset options

To change the options for offsets:

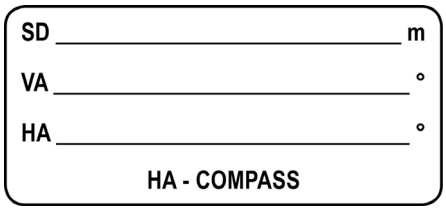
1. From the *Setup* screen, select *Offsets*.
2. Select the value you want to enter and then enter the value:

Offset Value	Description
Instrument Height	Enter the height of the unit (at eye level) from the ground. The entered instrument height is added to the vertical distance (VD) calculated and the total is displayed. A plus sign (+) next to VD indicates the reading is using an instrument height.
Critical HT/DIA	Enter the height or the diameter value that triggers an alert sound when performing two-point and three-point height calculations in length/lean/volume mode. Use the Critical Diameter to measure only tree logs that have diameters larger than the critical diameter. When using *Critical Height*, record the diameter and the bottom measurement and then as you move the instrument upward the unit beeps when the critical height is reached. Press the Fire button again to complete the measurement. When using *Critical Diameter*, record the diameter and use the tapering feature to calculate the height at which the critical diameter is reached on the tree trunk. As you move the instrument upward the unit beeps when the height corresponding to the critical diameter is reached.
Critical Area	Enter the circular area within which you want to measure trees. Trees outside the area are excluded, because the laser will not range outside the specified area. The *Critical Area* value is recalculated when you change the *Critical Radius* value.
Critical Radius	Enter the radius of the area within which you want to measure trees. Trees outside the area are excluded, because the laser will not range outside the specified radius. The *Critical Radius* value is recalculated when you change the *Critical Area* value. ***Note –*** *The value of this field must be less than 199 meters.*

Rangefinder measurements

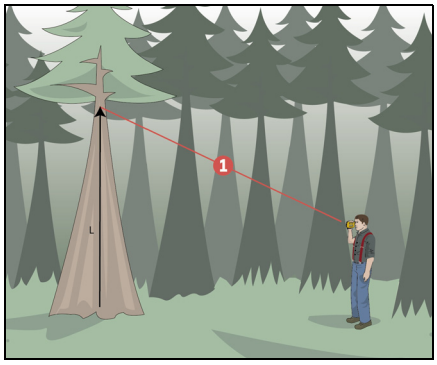
Use the rangefinder function to measure the height of an object.

1. From the main menu screen, select *Rangefinder*. The screen shows:



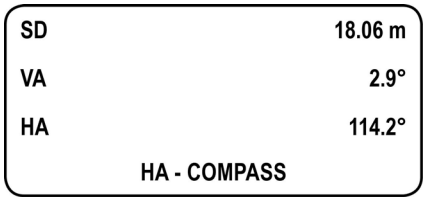
2. Align the crosshairs in the scope with the target and press the **Fire** button. The unit beeps and the results appear on the screen.

Note – *If the unit does not beep, or gives a short, sharp beep and the screen does not show any values, this indicates the rangefinder has been unable to obtain a distance to the target. Try again.*



The screen shows:

- The actual slope distance (SD) from the laser to the target
- The inclination (VA). A minus (-) sign indicates an angle below the horizontal.



To view the horizontal distance (HD) and vertical distance (VD), press ▲. A plus sign (+) after the VD value indicates a height offset has been added. Press ▲ again to return to the SD/VA display.

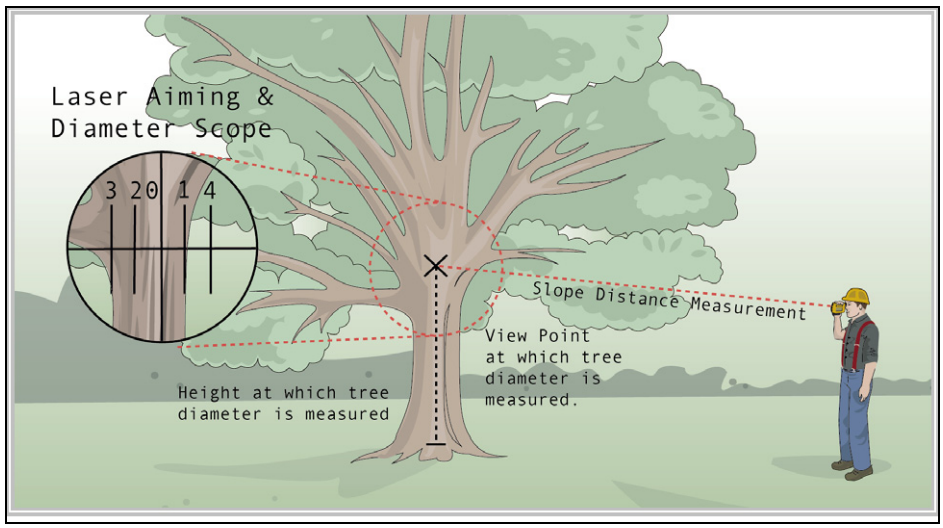
To take a new measurement, sight the target and then press the **Fire** button.

To view an accumulation of data (SD and HD) then in either measurement screen press ■. This displays a sum of all SD and HD values acquired. To return to the previous screen, press ■ again.

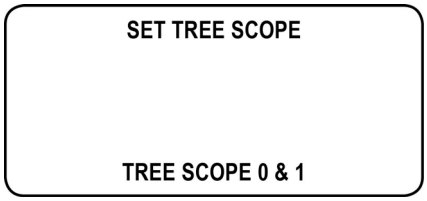
Tip – This method in particular is very useful when you cannot access an asset that you want to record the GNSS position for, or the asset is in a poor GNSS environment. Stand in a good GNSS environment, and use the rangefinder to record an offset GNSS position. For more information, refer to the documentation for your GNSS field software.

Tree diameter measurements

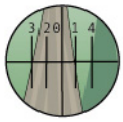
Use the tree diameter function to remotely measure the diameter of a tree using a single measurement.



1. From the main menu screen, select *Tree Diameter*. The screen shows:

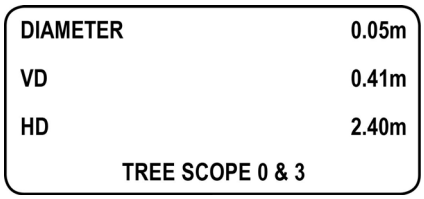


2. Look through the eyepiece and aim the laser at the tree trunk. Walk back or forward as required until the trunk is precisely aligned between any two of the stadia hairs in the scope.



   To change the stadia hairs you are using in the scope, press ▲ key. Press ▲ key until the pair of stadia hairs you want to use is shown on the LCD display.

3. To take the reading, press the **Fire** button. The screen displays the tree diameter, the vertical distance (VD), and the horizontal distance (HD).



If you wish to change the tree scope pairs at this point, press ▲. The information in the display is updated with recalculated data based on the tree scope pairs you select.

To take a new measurement, press the **Fire** button.

Length / lean / volume measurements

Use the *Length* / *Lean* / *Volume* menu to measure the tree length, lean, and volume.

The following measurement methods are available:

- Single point

  Use this method to calculate the height and volume of a tree based on a single measurement of the top of the trunk.

- Two point

  Use this method to calculate the height and volume and slope of a tree based on measurements of the bottom and top of the trunk.

- Three point

  Use this method to calculate the height and volume of a tree based on measurements of the bottom, centre and top of the trunk.

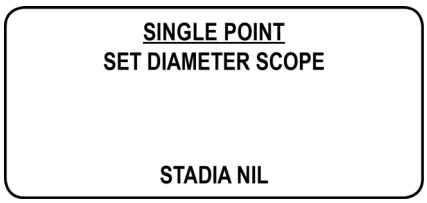
Note – *You are prompted to set the tapering factor when you select Length/Lean/Volume from the main menu. To change the tapering factor between measurements, you must navigate back to the main menu and reselect Length/Lean/Volume.*

Single point length/lean/volume measurements

Single point measurements are useful when there is a clear view of the top of the trunk. This method does not calculate Lean.

1. From the main menu screen, select *Length/Lean/Volume*.
2. Enter the tapering factor as a percentage. For example, a tapering factor of 10% indicates that the tree diameter varies by 10 cm for every 100 cm in length.

3. Select *Single Point*. The screen shows:



4. Press ▲ to select the stadia pair that you want to use. Press the **Fire** button to accept the selected stadia pair.

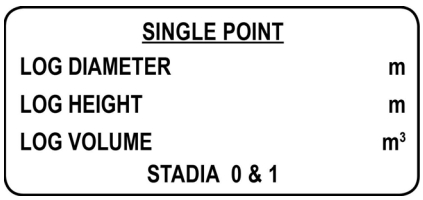
Note – *Select nil for the stadia hairs if you want to only calculate the log height and the horizontal distance from the laser.*

5. Once you have selected a stadia pair (or nil), enter the plot number and then the tree number.

   The rangefinder checks the internal memory to see if data already exists for the plot and tree you have entered.

6. If data already exists, you are prompted to delete it. Select *No* to keep the data and return to the main menu. Press ▲ and then the **Fire** button to select *Yes* to delete the data and then continue with the steps below.

   The screen shows something like:



7. Align the crosshairs in the scope with the base of the tree. Move backwards or forwards until the trunk is precisely aligned between the selected stadia hairs.

8. To take the reading, point at the top of the trunk and press the **Fire** button. The unit beeps and the results appear on the screen.

   If the tapering factor is set to zero, the volume of the log is calculated as the volume of a cylinder. If the tapering factor is not zero, then this value is used to calculate the base diameter and the volume is calculated as the volume of a frustum (truncated cone).

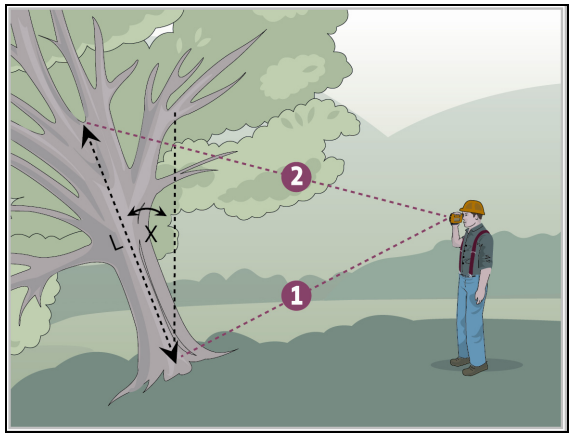
   To accumulate the log volume and log height, press ■. To return to the previous screen, press ■ again.

Note – *If the stadia scope is set to nil then no volume calculation is done and only the log height is accumulated.*

To take a new measurement, press the **Fire** button.

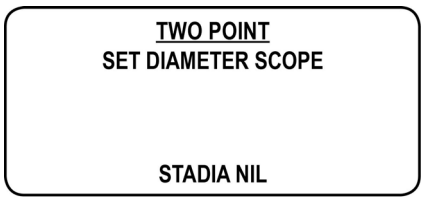
Two-point length/lean/volume measurements

Use this method to remotely calculate the height, volume, and lean of a tree, when there is a clear view of the base of the trunk and the top of the trunk.



Note – *To only measure trees that are above a certain height, set the Critical Height value in the Offsets screen. For more information, see* *Selecting offset options, page 43*.

1. From the main menu screen, select *Length/Lean/Volume*.
2. Enter the tapering factor as a percentage. For example, a tapering factor of 10% indicates that the tree diameter varies by 10 cm for every 100 cm in length.
3. Select *Two-Point*. The screen shows:



4. Press ▲ to select the stadia pair that you want to use. Press the **Fire** button to accept the selected stadia pair.

Note – *Select nil for the stadia hairs if you want to only calculate the tree length and lean.*

5. Once you have selected a stadia pair (or nil), enter the plot number and then the tree number.

   The rangefinder checks the internal memory to see if data already exists for the plot and tree you have entered.

6. If data already exists, you are prompted to delete it. Select *No* to keep the data and return to the main menu. Press ▲ and then the **Fire** button to select *Yes* to delete the data and then continue with the steps below.

   The screen shows Shoot Bottom.

7. Align the crosshairs in the scope with the base of the tree. Move backwards or forwards until the trunk is precisely aligned between the selected stadia hairs.

8. To take the reading, press the **Fire** button.

   The screen shows Shoot Top.

9. Do one of the following:

   – If you have set a critical height value (see Selecting offset options, page 43), pan the unit to aim toward the tree top. When the critical height is reached, the unit beeps continuously.

   – Align the crosshairs in the scope with the top of the tree trunk, making sure that the trunk is precisely aligned between the selected stadia hairs.

10. To take the reading, press the **Fire** button.

    The screen shows the results.

    To view the log lean, log height, and horizontal distance values, press ▲.

    If the tapering factor is set to zero, the volume of the log is calculated as the volume of a cylinder. If the tapering factor is not zero, then this value is used to calculate the base diameter and the volume is calculated as the volume of a frustum.

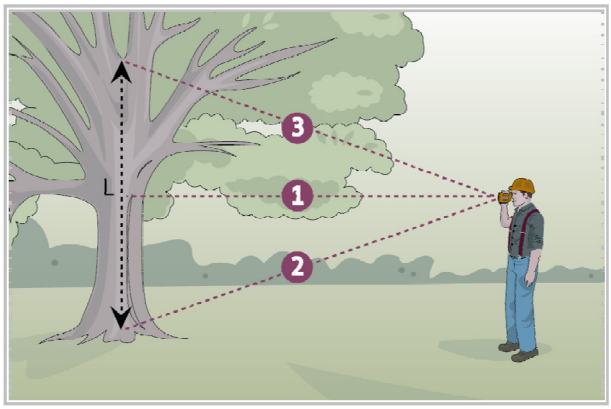
    To accumulate the log volume and log height, press ■. To return to the previous screen, press ■ again.

Note – *If the stadia scope is set to nil then no log diameter or log volume calculation is done and only the log lean and log height data is accumulated.*

To take a new measurement, press the **Fire** button.

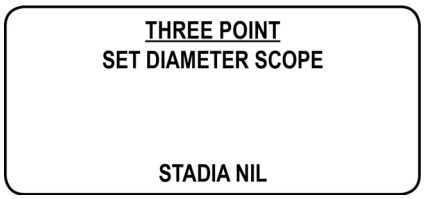
Three-point length/lean/volume measurements

Use this method to measure the diameter, height, and volume of a tree using three observations. This method is useful when the top and / or bottom of the trunk are obscured by brush or foliage. Alternatively you can enter a tree height and then the rangefinder will alert you when that height (known as Critical Height) has been reached. This method calculates the diameter, height, and volume using one range and three measured angles.



Note – *To only measure trees that are above a certain height, set the Critical Height value in the Offsets screen. For more information, see* *Selecting offset options, page 43*.

1. From the main menu screen, select *Length/Lean/Volume*.
2. Enter the tapering factor as a percentage. For example, a tapering factor of 10% indicates that the tree diameter varies by 10 cm for every 100 cm in length.
3. Select *Three-Point*. The screen shows:



4. Look through the scope at the mid point of the tree you wish to measure. Walk backward or forward until the diameter you wish to measure is lined up between two the stadia hairs in the scope.
5. Press ▲ to select the stadia pair that you want to use. Press the **Fire** button to accept the selected stadia pair.

Note – *Select nil for the stadia hairs if you want to only calculate the tree length and lean.*

6. If you have selected a stadia pair, enter the plot number and then the tree number.

   The rangefinder checks the internal memory to see if data already exists for the plot and tree you have entered.
7. If data already exists, you are prompted to delete it. Select *No* to keep the data and return to the main menu. Press ▲ and then the **Fire** button to select *Yes* to delete the data and then continue with the steps below.

   The screen shows Shoot Middle.
8. Line up the tree in the scope as before and press the Fire button.

   The screen shows Shoot Bottom.
9. Use the scope to point at the base of the trunk and then press the **Fire** button.

Note – *At this point, only the measurement of the vertical angle is required, not distance. This allows the observation to the bottom of the tree, even if scrub or bush partially obscures the view.*

   The screen shows Shoot Top.

10. Do one of the following:
    - If you have set a critical height or critical diameter value (see Selecting offset options, page 43), pan the unit toward the top of the tree. When the critical height is reached, the unit beeps continuously.
    - Use the scope to point at the top of the trunk and then press the **Fire** button.

Note – *At this point, only the measurement of the vertical angle is required, not distance. This allows the observation to the top of the tree, even if foliage partially obscures the view.*

11. To take the reading, press the **Fire** button.

    The screen shows the calculated diameter, height, and volume.

Note – *If the stadia scope is set to nil then no log diameter or log volume calculation is done and only the log lean and log height data is accumulated.*

To take another measurement, press the Fire button again.

Managing collected length/lean/volume data

The Length/Lean/Volume menu also has items for retrieving, printing, and viewing the measurements saved in the unit's memory. The *Clear Memory* menu item deletes the whole memory.

Downloading length/lean/volume data

1. To save the downloaded data to a file, open the Windows HyperTerminal software on your computer.
2. Connect the rangefinder to the computer using Bluetooth wireless technology.
3. In the HyperTerminal software, select *Capture Text* from the *Transfer* menu and then enter an appropriate file name. Click the **Start** button. All serial data sent to the computer will be saved in the specified text file.
4. From the main menu screen, select *Length/Lean/Volume*.
5. Select *Download*.
6. You are prompted to start the download. Press any key on the rangefinder to start the download.
7. Once the download is complete, the rangefinder beeps and the message Download Complete appears on the screen.
8. In the HyperTerminal software, select *Transfer* / *Capture Text* / *Stop*.

   All data is sent as ASCII characters, separated by commas. This is useful for importing into a spreadsheet. For more information, see Tree measurement string format, page 65.

Printing the tree table

1. From the main menu screen, select *Length/Lean/Volume*.
2. Select *Print Tree Table*.
3. A message on the screen prompts you to enter a plot number. Enter the number using the ■ and ▲ keys and then press the Fire button to confirm.
4. Use the ▲ key and then the Fire button to view or print a table of all the measured trees in the plot.

Clearing the memory

1. From the main menu screen, select *Length/Lean/Volume*.
2. Select *Clear Memory*.
3. Press any key on the rangefinder to confirm. Any data stored in the rangefinder is deleted.

Canopy spread measurements

1. From the main menu screen, select *Canopy Spread*.

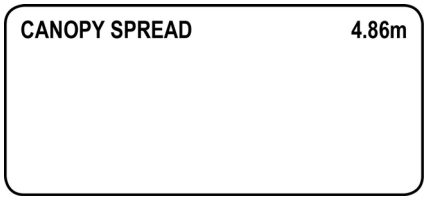
   The screen shows Shoot 1.

2. Look through the scope at the left-most point of the tree canopy you wish to measure. Press the **Fire** button.

   The screen shows Shoot 2.

3. Look through the scope at the right-most point of the tree canopy you wish to measure. Press the **Fire** button.

   The screen shows the calculated canopy spread:



CHAPTER

5

Burden Finder Measurements

In this chapter:

This chapter describes how to set preferences and take measurements using the rangefinder with the burden finder firmware installed.

All of the measurement types described in this chapter can also be used to record offset GPS positions, for example when you cannot access the asset that you want to record the GPS position for, or when the asset is located in a poor GPS environment.

Note – *The LaserAce 1000 rangefinder's internal compass is sensitive to many factors, including changing the battery and changes in the environment. Trimble recommends calibrating the internal compass* ***at the start of each data collection session****. For more information, see* *Calibrating the compass, page 26**.*

Setting rangefinder preferences

To set your preferences for the rangefinder, press  to scroll through the options on the main screen until *Setup* is highlighted and then press the **Fire** button. The *Setup* screen appears.

Selecting units

To select the units used for measurements and calculations for any version of the rangefinder:

1. From the *Setup* screen, select *Units*.
2. Select the measurement and the units you want to use:

Measurement	Available units
Range	Meters, feet
Angles	Degrees, gons

Selecting the operating mode

To change the operating mode:

1. From the *Setup* screen, select *Configuration*.
2. Select the operation and the option you want to use:

Operation	Options
Ranging	• First Hit The standard mode, used for most types of operation where you have a clear sight of the target. • Last Hit Instructs the laser to return the last detectable hit in a multiple hit scenario. This is useful when ranging through a limited type of single obstructions, such as wire fencing or glass. ***Note –*** *The distance between the initial obstruction and the ultimate target must be several meters for a valid range to be calculated.* ***Note –*** *Last Hit mode cannot be used with reflective targets or prisms, or used to calculate ranges to objects that have numerous obstructions in their path such as scrub, trees, and double-glazing.*
Interface	Trimble Free format ***Note –*** *This is the default setting. Do not change this setting.*
Power	AutoPower On, Off When Auto Power is set to On, the unit automatically turns off one minute after the last key press.

Selecting offset options

To change the options for offsets:

1. From the *Setup* screen, select *Offsets*.
2. Select the value you want to enter and then enter the value:

Offset Value	Description
Instrument Height	Enter the height of the unit from ground level. The entered instrument height is added to the vertical distance (VD) calculated and the total is displayed. A plus sign (+) next to VD indicates the reading is using an instrument height.

Burdenfinder measurements

The *Burdenfinder* menu provides submenus to accurately determine rock face / blast hole burdens.

Measuring a new profile

To determine a new burden and depth table for a rock face:

1. Use the *Hole Details* menu to enter the drill details, including drill angle, collar to crest offset, and the minimum burden that you require.
2. Use the *Bench* menu to enter the face number and profile number and then shoot the crest and toe of the rock face.

   Once you have entered the hole details and measured the bench, the Profile menu becomes available.
3. Use the *Profile* menu to shoot the profile of the rock face.

Note – *When measuring the profile, the rangefinder beeps to inform you when a measured burden is below the minimum burden entered.*

These steps are described in more detail below.

Entering hole details

Figure 5.1 shows a typical setup:

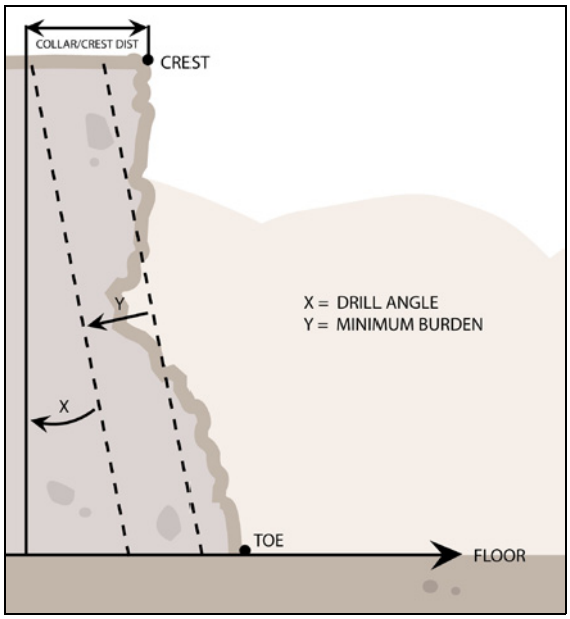


Figure 5.1 Hole details

1. From the main menu screen, select *Burdenfinder*.
2. Select *Hole Details*.
3. Select *Drill Angle* and then press the **Fire** button. Enter the value and then press the **Fire** button to move to the next screen.

   To enter measurements, press ▲ to move to the digit you want to enter, and then press ■ to select the number you want to enter. Press ▲ again to move to the next digit.
4. Enter the collar crest value and then press the **Fire** button to move to the next screen.
5. Enter the minimum burden required and then press the **Fire** button to move to the next screen.
6. The other *Hole Details* menu items provide functions for managing profiles (see Managing profiles, page 58). To return to the *Burdenfinder* menu, press ●.

Measuring the bench

Figure 5.2 shows a typical setup:

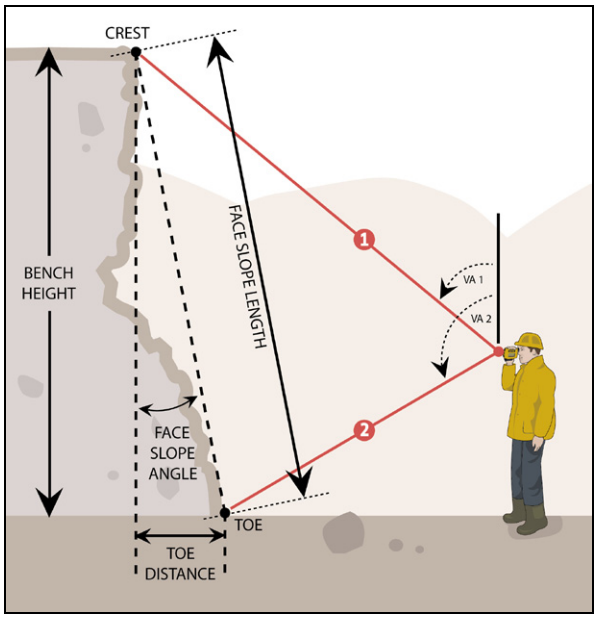


Figure 5.2 Crest and toe details

1. From the *Burdenfinder* menu screen, select *Bench*.
2. Enter the face number and then press the **Fire** button to move to the next screen.

   To enter digits, press ▲ to move to the digit you want to enter, and then press ■ to select the number you want to enter. Press ▲ again to move to the next digit.
3. Enter the profile number and then press the **Fire** button to move to the next screen.
4. Aim the rangefinder at the crest and press the **Fire** button to shoot the crest.
5. Aim the rangefinder at the toe and press the **Fire** button to shoot the toe.

   The screen shows the slope, bench and toe details.
6. To view the face angle, press ▲.
7. To return to the *Burdenfinder* menu, press ●.

Shooting the profile of the rock face

Use the profile mode to shoot points on the rock face relative to the intended blast hole, as shown in Figure 5.3:

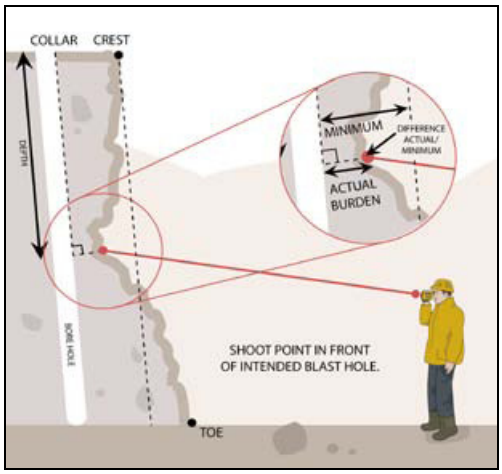


Figure 5.3 Shooting the rock profile

1. From the *Burdenfinder* menu screen, select *Profile*.
2. Aim the rangefinder at the point on the rock face you want to shoot and then press the **Fire** button.
3. To view the minimum burden, press ▲.
4. To view the maximum burden, press ■.
5. Keep shooting points on the rock face until you have finished shooting the profile.

   By sequentially "tilting" the rangefinder down the rock face shooting from crest to toe, a burden profile of the face (relative to the intended blast hole) may be determined. Shoot any point on the rock face, which is adjacent to and in the plane of the intended blast hole.
6. To return to the *Burdenfinder* menu, press ●.

Managing profiles

The *Hole Details* menu provides options for managing profiles stored on the rangefinder.

Reviewing/recalculating an existing profile

The burden and depth table results are stored in the rangefinder's internal memory. As each profile has a face number and hole number, each unique profile can be recalled and the burden and depth table reviewed.

1. Select the *Hole Details* menu and then select *View Profile*.
2. Enter the face number and hole number of the profile you wish to review.

   The rangefinder then displays the burden and depth table for the profile you requested.
3. To recalculate the burden and depth table for a profile, return to the *Hole Details* menu and change the drill angle, collar to crest offset and minimum burden.
4. Follow steps 1 and 2 above to review the profile. The burden and depth table has been recalculated based on the new parameters you entered.

Downloading profile data

1. To save the downloaded data to a file, open the Windows HyperTerminal software on your computer.
2. Connect the rangefinder to the computer using Bluetooth wireless technology.
3. In the HyperTerminal software, select *Capture Text* from the *Transfer* menu and then enter an appropriate file name. Click the **Start** button. All serial data sent to the computer will be saved in the specified text file.
4. From the *Hole Details* screen, select *Download*.
5. You are prompted to start the download. Press any key on the rangefinder to start the download.
6. Once the download is complete, the rangefinder beeps and the message Download Complete appears on the screen.
7. In the HyperTerminal software, select *Transfer* / *Capture Text* / *Stop*.

   All data is sent as ASCII characters.

Printing the profile data

1. From the *Hole Details* screen, select *View/Print Profile*.
2. A message on the screen prompts you to enter a face number. Enter the number using the  and  keys and then press the **Fire** button to confirm.
3. A message on the screen prompts you to enter a profile number. Enter the number using the  and  keys and then press the **Fire** button to confirm.
4. Use the  key and then the **Fire** button to view or print a table of burden profile.

Clearing the memory

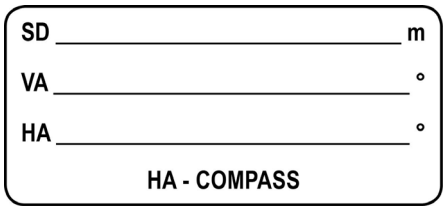
1. From the *Hole Details* screen, select *Clear Memory*.
2. Press any key on the rangefinder to confirm.

   Any data stored in the rangefinder is deleted.

Rangefinder measurements

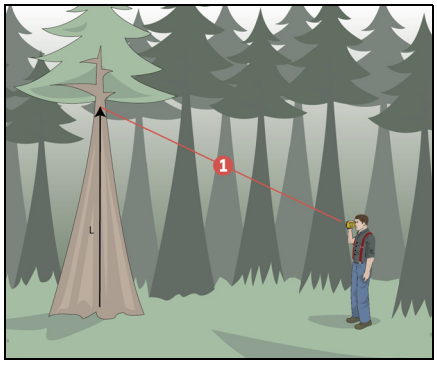
Use the rangefinder function to measure the height of an object.

1. From the main menu screen, select *Rangefinder*. The screen shows:



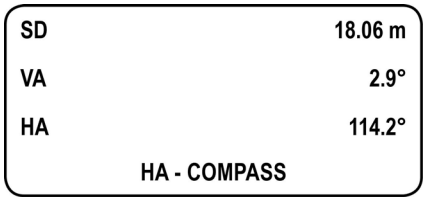
2. Align the crosshairs in the scope with the target and press the **Fire** button. The unit beeps and the results appear on the screen.

Note – *If the unit does not beep, or gives a short, sharp beep and the screen does not show any values, this indicates the rangefinder has been unable to obtain a distance to the target. Try again.*



The screen shows:

- The actual slope distance (SD) from the laser to the target
- The inclination (VA). A minus (-) sign indicates an angle below the horizontal.



To view the horizontal distance (HD) and vertical distance (VD), press ▲. A plus sign (+) after the VD value indicates a height offset has been added. Press ▲ again to return to the SD/VA display.

To take a new measurement, sight the target and then press the **Fire** button.

To view an accumulation of data (SD and HD) then in either measurement screen press ■. This displays a sum of all SD and HD values acquired. To return to the previous screen, press ■ again.

Tip – This method in particular is very useful when you cannot access an asset that you want to record the GNSS position for, or the asset is in a poor GNSS environment. Stand in a good GNSS environment, and use the rangefinder to record an offset GNSS position. For more information, refer to the documentation for your GNSS field software.

Face width measurements

Use the face width function to remotely calculate the height and distance between two or more successive points. You can use this function to calculate the height of objects or to calculate the gradient between the measured points.

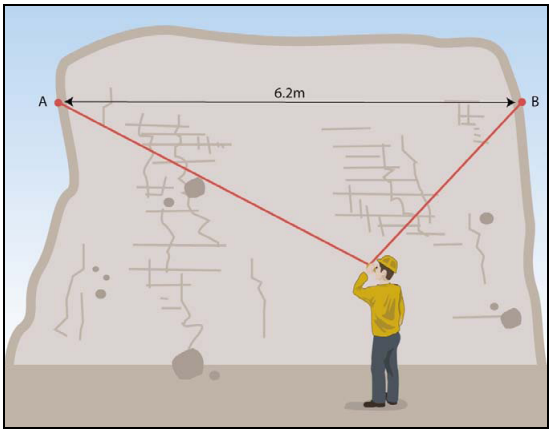


Figure 5.4 Measuring face width

1. From the main menu screen, select *Face Width*. Instructions are shown on the screen.
2. Point and shoot the laser at Point A, shown in Figure 5.4. The unit beeps to confirm the measurement has been taken.
3. Scan across the rock face and then point and shoot the laser at Point B.

   The unit beeps and the face width measurement is shown on the screen.

APPENDIX

A

Data Formats

In this appendix:

This appendix provides information about the output data formats for the LaserAce 1000 rangefinder. This information may be useful if you are using field software that is not Trimble TerraSync or ESRI ArcPad software.

NMEA output format

The data output is in a standard NMEA format. IF1/3 is floating field & IF2/4 is fixed string length (note that in IF2/4 the range is restricted to 999.99m).

Example data strings (note the strings are terminated with carriage return & line feed):

IF1

$PTNLA,HV,2.94,M,288.1,D,8.6,D,2.98,M*5F

IF2

$PTNLA,HV,002.94,M,288.1,D,008.6,D,002.98,M*67

Field	Description	Range	
1	NMEA sentence type	$PTNLA/ Customer Spec.	
2	Horizontal Vector	HV	
3	Horizontal Distance	2.94–5000.00	002.94
4	Units of Measurement	M (meters)/F (feet)	
5	Horizontal Angle	0.01-3.59.99	288.1
6	Units of Measurement	D (degree)/G (gons)	
7	Vertical Angle	-0.1–080.0	-08.6
8	Units of Measurement	D (degree)/G (gons)	
9	Slope Distance	2.98–5000.00	002.98
10	Units of Measurement	M (meters)/F (feet)	
11	Check Sum	*67	

Tree measurement string format

All the entries in the memory are sent out as ASCII characters. It can be imported into a spreadsheet.

Example measurement string:

$PTNLB,HT,004.40,M,DIA,001.06,M,VOL,003.87,M3,TAP,00.00%,R,020.22,M,V,015.1,D*61

Field	Description	Value
1	String Header	$PTNLB
2	Tree Height	HT
3	Measured Tree Height	004.40
4	Units of Measurement	M (Meters) or F (Feet)
5	Tree Diameter	DIA
6	Measured Tree Diameter	001.06
7	Units of Measurement	M (Meters) or F (Feet)
8	Volume of Tree	VOL
9	Measured Volume of Tree	003.87
10	Units of Measurement	M3 (Cubic Meters) or F3 (Cubic Feet)
11	Tapering Factor	TAP
12	Tapering Factor Value	00.00%
13	Range to the Tree (Slope Distance)	R
14	Measured Range to the Tree	020.22
15	Units of Measurement	M (Meters)
16	Vertical Angle to the Top of the Tree	V
17	Measured Vertical Angle	015.10
18	Unit of Vertical Angle	D (Degrees) or G (Gons)
19	Check Sum	*61

Burden finder string format

When a single measurement is taken the rangefinder puts out a data string. The data output is in a standard NMEA format. IF1/3 is a floating field and IF2/4 is fixed string length (in IF2/4 the range is restricted to 999.99 m).

Example data strings

MDL Free Format:

$PTNLA,HV,2.94,M,288.1,D,8.6,D,2.98,M*5F

MDL Fixed Format:

$PTNLA,HV,002.94,M,288.1,D,008.6,D,002.98,M*67

Field	Description	Range	
1	NMEA sentence type	$PTNLA/ Customer Spec.	
2	Horizontal Vector	HV	
3	Horizontal Distance	2.94–5000.00	002.94
4	Units of Measurement	M (meters) / F (feet)	
5	Horizontal Angle	0.01-3.59.99	288.1
6	Units of Measurement	D (degree) / G (gons)	
7	Vertical Angle	-0.1–080.0	-08.6
8	Units of Measurement	D (degree) / G (gons)	
9	Slope Distance	2.98–5000.00	002.98
10	Units of Measurement	M (meters) / F (feet)	
11	Check Sum	*67	

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